



Advanced Lignite Demonstration Program

**MELBOURNE**  
VICTORIA AUSTRALIA







# Contents

Advanced Lignite Demonstration Program (ALDP)	2
Why Victorian Lignite?	4
What is Victorian Lignite?	6
The Future of Victorian Lignite	8
Government has a role	10
CarbonNet	10
Energy Technology Innovation Strategy (ETIS)	11
Clean Coal Victoria	11
Brown Coal Innovation Australia	11
Why Invest in Victoria?	14
Support for Investors	16







# Advanced Lignite Demonstration Program (ALDP)

The Australian Commonwealth Government and the Victorian State Government are seeking proposals from parties interested in developing pre-commercial demonstration scale, coal upgrading processes for raw lignite.

Pre-commercial demonstration is defined as demonstration of a process, or integration or adaptation of a process on Victorian lignite. Projects must involve demonstrable technology risk, and be of sufficient size, to provide process and performance guarantees on successful completion of the pre-commercial demonstration plant. It is envisaged that, upon completion of the technology demonstration, a commercial facility will be able to be financed and constructed.

The prime focus of the ALDP is on fit-for-purpose “coal upgrading” processes for raw lignite (including materials handling). Proposals must identify the product stream which is being targeted and present a plausible pathway to market.

Technologies most relevant and applicable to Victoria’s Latrobe Valley, and meeting the Program’s definition and objectives, will be eligible for the Program regardless of whether they have been developed in Victoria, elsewhere in Australia or overseas. Projects must be constructed in Victoria.

Proposals will be submitted via a two stage competitive tender process of which the first stage is an Expression of Interest (EOI). EOI proposals will be assessed by an Independent Assessment Panel, with short-listed proponents requested to submit a Request for Proposal (RFP).

Currently the funding offered is up to A\$90M, which will be used to fund projects assessed by the Commonwealth and Victorian Governments as addressing the Program objectives.

It is expected that projects will have a duration of four years, with funding available for projects to commence before 30 June 2014. It is expected that a range of projects with various coal upgrading technologies and end-use applications will be selected for funding.

Pre-commercial technologies are eligible for funding under this Program and must encompass coal upgrading which will include, but is not limited to:

- Drying
- Dewatering
- Char Production, and
- Separation.

The Program may also include funding for pre-commercial coal conversion technologies in conjunction with any coal upgrading process, including, but not limited to:

- Liquefaction,
- Combustion, and
- Gasification

where it is directly related to the pre-commercial coal upgrading technology.

Full details of the Program, including the Expression of Interest document, are available at: [www.dpi.vic.gov.au/ALDP](http://www.dpi.vic.gov.au/ALDP)

For any additional information on the Program, please contact Mr Brian Davey, Manager Pre-commercial Demonstration Programs, Energy Technology Innovation Division, on +61 (0)409 332 995 or email [dpi.etis@dpi.vic.gov.au](mailto:dpi.etis@dpi.vic.gov.au).







# Why Victorian Lignite?

Victoria's lignite, located in the Latrobe Valley, 150 kms south east of Melbourne, is the second largest deposit in the world, estimated to total 430 billion tonnes, with an estimated potential economic resource of 33 billion tonnes.

It is the State's largest mineral endowment, containing two to three times the energy capacity of the North West Shelf in Western Australia.

For decades this resource has powered the growth of Victoria's economy with low-cost, reliable base-load energy. Lignite continues to supply over 90 per cent of our electricity needs.

The introduction of a price on carbon imposes significant challenges to the continued use of Victoria's lignite. These challenges will have implications for the security of our electricity supply and the growth of the economy.

If coal is to continue to be used, new approaches and technologies will be needed that result in significantly lower emissions.

Due to rapid changes in global energy demand, rising oil prices and strengthening commodity markets, the opportunities for major investment in the sustainable use of Victoria's lignite have increased, not only for domestic markets, but also for the rapidly expanding markets in the Asia Pacific and beyond.

With hundreds of years worth of coal in the ground, the development of low-emission coal products for export will make a major contribution to Victoria's economy for decades to come. Development of the resource, particularly in the Latrobe Valley, could also make use of the large carbon storage resources that lie in the Gippsland Basin, close to the mines and power generators.







# What is Victorian Lignite?

Victoria's lignite is typically low in ash, sulphur, heavy metals and nitrogen, making it very low in impurities by world standards.

However, its high moisture content, between 48 and 70 per cent, reduces its effective energy content (average 8.6 MJ/kg on a net wet basis or 26.6 MJ/kg on a gross dry basis).

Lignite seams in the Latrobe Valley are up to 100 metres thick, with multiple seams often giving virtually continuous lignite thickness of up to 230 metres. Seams are typically located under only 10-20 metres of overburden.

Favourable coal to overburden ratios in the Latrobe Valley, of between 0.5:1 and 5:1, indicate a high tonnage of coal for every cubic metre of non-coal material mined. This, combined with the easy digging characteristics of the coal, make it some of the lowest cost coal in the world.









# The Future of Victorian Lignite

Coal is abundant, affordable, available and reliable, and is vital to the world's sustainable energy needs.

World energy demand, consumption and prices are dramatically increasing, as is the price of metallurgical and thermal coal.

With lignite being integral to Victoria's economy, the use of drying, gasification and liquefaction technologies will enable the State's lignite to be used to produce key commodities such as diesel, urea, petrochemicals and hydrogen, as well as exportable coal, and in so doing, substitute for the conventional feedstocks such as oil, gas and black coal.

Technology to convert coal to liquid or gaseous fuels has been available in various forms since the 1920s, but cost has rendered it uncompetitive. The new market dynamics for commodities such as diesel, urea, methanol and its derivatives, and the adoption of new low emission coal technologies, are now providing opportunities for lignite as a low cost feedstock to compete with the traditional feedstocks commonly used to produce these commodities.

In addition to opportunities to convert lignite to value added tradable commodities, the adoption of suitable drying technologies is expected to enable lignite to be exported and compete directly in black coal markets as an energy and feedstock resource.

The following products present exciting challenges and opportunities for Victorian coal.

## **Solid fuels and products**

Lignite in raw form can be used for boiler fuel in power generation. Value can be added with drying technologies to transform the product into high energy content briquettes and pellets that could compete with black coal as an exportable fuel.

Chars and cokes may potentially be derived from lignite for pyrometallurgical applications to produce reductants and carburising chemicals, and as a general carbon source for other applications. Calcium loaded char has applications in water and waste treatment and as an ion-exchange medium.

In the future, lignite may even be refined into a purer form of carbon for use in production of a myriad of carbon products including carbon fibres, carbon anodes, activated carbons, filter aids, pigments, graphite lubricants and conductors, and formed carbon materials.

## **Gaseous products and hydrogen**

Gasification of coal to produce synthetic gas can convert solid coal into a gaseous feedstock that is a precursor to a range of other products. The process can also facilitate the separation and sequestration of carbon dioxide.

Hydrogen, one product that can be derived from syngas, has the potential to be used directly as a fuel gas, in fuel cell technologies, stationary power production and in vehicles.

## **Liquid products**

Liquid products from coal can be produced either from syngas via gasification or by the direct liquefaction of lignite. Through the syngas pathway, liquid fuel products include diesel, methanol, fuel gasoline blends, and high octane gasoline extenders.

The direct liquefaction pathway generally produces lower quality products such as synthetic crude oil which, with further processing, may be used to produce fuel oil, diesel, motor fuel blends, kerosene, heating oil etc. Non-fuel products may also be produced, including solvents, polymers, surfactants, lubricants and a suite of other carbon-based chemicals.

## **Waxes, resins and polymers**

A range of waxes can be produced using products derived from lignite, as well as phenolic resins and plastics, composites, and low strength structural and building materials.

## **Agricultural products**

Syngas manufactured from coal can be used to produce ammonia, the key precursor to nitrogenous fertilisers.







# Government has a role

The Victorian Government recognises that it has a role to play in developing new low emission technologies and reducing the barriers to investment.

A whole-of-government approach and alignment between the Victorian State Government and Australian Commonwealth Government objectives on coal development, help to deliver a clear stable policy and regulatory environment.

Providing access to the coal resource within a well managed and regulated framework is also necessary to enable investment.

The Victorian Government has asked the Department of Primary Industries to undertake a market analysis to assess industry appetite for a competitive coal allocation tender process, to ensure that companies wanting to invest in low emissions coal technologies in Victoria have greater certainty about access to coal.

The Victorian Government is developing future low emission options for our lignite by supporting research, development, demonstration and deployment of low-emission coal projects through initiatives such as Victoria's Carbon Capture and Storage Network Project (CarbonNet), Energy Technology Innovation Strategy (ETIS), Clean Coal Victoria (CCV), and Brown Coal Innovation Australia (BCIA).

## CarbonNet

The CarbonNet Project is investigating the potential for large-scale carbon capture and storage (CCS) in Victoria's Gippsland region; capturing carbon dioxide (CO<sub>2</sub>) from electricity generation, industrial processes and coal-based industries in the Latrobe Valley, and injecting it deep underground offshore in the Gippsland Basin for safe, long term storage.

The Gippsland region in Victoria is recognised as a world-class location offering significant potential for CCS technology. As well as being close to Victoria's vast coal resources and power generation hub in the Latrobe Valley, the Gippsland Basin has been found to contain both the best quality and largest volume of CO<sub>2</sub> reservoirs of 25 major basins across Australia (2009 National Carbon Task Force).

Managed by the Victorian Department of Primary Industries, the CarbonNet Project commenced in 2009. Under the Australian Government's \$4.5 billion Clean Energy Initiative it was selected as a CCS Flagship project in February 2012 and awarded \$100 million in joint Commonwealth and Victorian Government funding.

The funding will allow complex feasibility studies over the next two years, to move the project towards the demonstration of large-scale CCS. Feasibility studies involve comprehensive assessments of potential storage sites. This includes refinements to existing 3D models of the region's geology, laboratory work, and offshore appraisal drilling to help validate findings and determine the optimum location for the safe, long-term injection and storage of CO<sub>2</sub>. Research is also focused on potential carbon capture plants, transport pipelines and assessment of commercial, financial, and economic dimensions to develop a business model to attract private sector investment.

With its prime location, industry support and ability to rapidly escalate to commercial deployment, the CarbonNet Project has the potential to deliver one of the world's first commercial scale CCS networks.

For more information visit [www.dpi.vic.gov.au/ccs](http://www.dpi.vic.gov.au/ccs) or contact Richard Brookie, CarbonNet Project Director, Department of Primary Industries, on +61 3 9658 4206, or email: [CarbonNet.Info@dpi.vic.gov.au](mailto:CarbonNet.Info@dpi.vic.gov.au).



## Energy Technology Innovation Strategy (ETIS)

The Victorian Government provides direct support for industry led low emission energy technology development through its Energy Technology Innovation Strategy (ETIS). The Strategy aims to accelerate a variety of pre-commercial energy technologies through research, development, demonstration and deployment stages, so that they are ready for market uptake.

The focus is on those technologies best able to deliver clean, cost-competitive energy supplies for the State. This includes new technologies for power generation as well as looking at alternative high-value, high volume applications for Victoria's lignite resource.

Delivered in partnership with industry, the Strategy seeks to balance both the environmental and economic impacts of climate change. There is a strong focus on low emission coal technologies, applicable to lignite deposits worldwide, but also designed to ensure the continued use of low cost Victorian lignite resources.

For more information visit [www.dpi.vic.gov.au/etis](http://www.dpi.vic.gov.au/etis) or contact Dr Peter Redlich, Director, Energy Technology Innovation Division, Department of Primary Industries, on +61 3 9658 4195, or email: [dpi.etis@dpi.vic.gov.au](mailto:dpi.etis@dpi.vic.gov.au).

## Clean Coal Victoria

Clean Coal Victoria (CCV) was established by the Victorian Government, within the Department of Primary Industries, to develop strategic plans to manage Victoria's lignite resource. CCV plays a key role in working with the community and industry to attract new investment and economic growth in areas such as the Latrobe Valley.

CCV is leading the development of the Victorian Brown Coal (Lignite) Roadmap, to identify future pathways for Victoria's lignite in three time frames: 2020, 2035 and 2050. The Roadmap is an evidence-based process, involving industry, government, and academics from Australia and internationally. It is designed to assist the Victorian Government to develop future resource and innovation policy.

The Victorian Brown Coal (Lignite) Roadmap and the results of the coal allocation market analysis will feed into a Coal Strategic Plan. The Plan will identify actions to address issues associated with the long-term development of Victoria's lignite from an economic, community and environmental perspective. The development of the Plan will also involve significant consultation with stakeholders and local communities in affected areas, and will cover land use planning, infrastructure planning, resource conflict issues and best-practice mine rehabilitation options.

For more information visit [www.dpi.vic.gov.au/earth-resources/coal/prospectivity/clean-coal-victoria](http://www.dpi.vic.gov.au/earth-resources/coal/prospectivity/clean-coal-victoria) or contact Mr Charles Speirs, Director, Clean Coal Victoria, Department of Primary Industries, on +61 3 5160 9001, or email: [charlie.speirs@dpi.vic.gov.au](mailto:charlie.speirs@dpi.vic.gov.au).

## Brown Coal Innovation Australia

Brown Coal Innovation Australia (BCIA) is a not-for-profit, member-based company with a mandate to invest in the development of skills, networks and low-emissions technologies that will broaden the sustainable use of Australia's lignite resource.

BCIA was established in late 2009 with an initial \$15 million in funding provided by the Victorian Government. The Company currently manages multi-million dollar State and Commonwealth funding, and serves as the Australian National Low Emissions Coal R&D Brown Coal node.

BCIA co-invests to support R&D initiatives that are technically excellent and that will lead to increased commercial deployment of low-emissions lignite technologies in the short, medium and long term. The Company also contributes to intelligence gathering and analysis of global R&D for its rapidly growing membership and the broader Australian community.

BCIA has also formed strategic relationships with other influential organisations in the low-emissions and innovation sectors.

For more information visit <http://www.bcinnovation.com.au> or contact Dr Phil Gurney, Chief Executive Officer, Brown Coal Innovation Australia, on +61 3 9653 9601, or email: [phil.gurney@bcinnovation.com.au](mailto:phil.gurney@bcinnovation.com.au).











# Why Invest in Victoria?

Located in Australia's south-east, Victoria has one of the strongest economies and most enviable lifestyles in the developed world.

Victoria is one of the fastest and easiest places in the world to set up a business. The Victorian Government is pro-business, fostering an environment of growth and innovation.

Although Victoria occupies just 3% of Australia's land mass, it makes up about 25% of the national economy.

Victoria has great universities, a reputation for innovation and technology development, and a very multicultural population, which has led to diverse skills and a global outlook.

Melbourne consistently ranks in the top three World's Most Liveable cities according to the Economist Intelligence Unit.

The Port of Melbourne is Australia's largest container port, handling almost 40% of Australia's container trade as well as being one of the largest general cargo ports. With trade demand forecast to double within the next 10 to 12 years, the Victorian Government has announced its intention to develop container capacity at the Port of Hastings, together with a plan to expand Melbourne's port capacity to provide business and industry with ongoing certainty and confidence.

Melbourne International Airport is rated among the world's top five, and is Australia's largest curfew-free, 24/7 airport.

More than 1,000 financial services organisations and 40 banks are based in Melbourne. Australia's banking sector is recognised as one of the safest and strongest in the world.

Melbourne's resilience through the global financial crisis reinforced the importance of our low cost, prudent approach to funds management and well regulated financial culture.







# Support for Investors

Victoria offers business the services of a world-class investment attraction and facilitation agency, Invest Victoria, with a global network of 14 business offices.

Invest Victoria can:

- Provide you with the latest market intelligence, including information on R&D capabilities, skills and costs
- Design itineraries and programs for your company representatives to gather intelligence and make contacts here
- Link you into networks, grants and support programs
- Put you in touch with suppliers, service providers and potential partners
- Guide you through infrastructure and approvals
- Provide ongoing support for your business.





# Our Global Network

## Melbourne, Australia

Invest Victoria  
Level 36, 121 Exhibition Street  
Melbourne  
Victoria 3000  
Australia  
Phone: +61 3 9651 8100  
Fax: +61 3 9651 9531  
info@invest.vic.gov.au

## Bangalore, India

Victorian Government Business Office  
Level 1, Pride Elite Building  
10 Museum Road  
Bangalore 560001  
India  
Phone: +91 80 41227560  
Fax: +91 80 41227569  
bangalore@invest.vic.gov.au

## Dubai, United Arab Emirates

Victorian Government Business Office  
Office 111, 1st Floor Emarat Atrium  
Sheikh Zayed Road  
United Arab Emirates  
Phone: +971 4 321 2600  
Fax: +971 4 321 2700  
dubai@invest.vic.gov.au

## Hong Kong

Victorian Government Business Office  
2108 Harbour Centre  
25 Harbour Road  
Wan Chai  
Hong Kong  
Phone: +852 2587 1133  
Fax: +852 2802 9675  
hongkong@invest.vic.gov.au

## Kuala Lumpur, Malaysia

Victorian Government Business Office  
Suite 23.1, Level 23 Menara IMC  
8 Jalan Sultan Ismail  
50250 Kuala Lumpur  
Malaysia  
Phone: +60 3 2055 1502  
Fax: +60 3 2055 1489  
kualalumpur@invest.vic.gov.au

## Nanjing, China

Victorian Government Business Office  
Suite 1164, 11th Floor  
World Trade Centre  
Jinling Hotel  
2 Hanzhong Road  
Nanjing 210005  
China  
Phone: +86 25 8470 1231  
Fax: +86 25 84709 821  
nanjing@invest.vic.gov.au

## Shanghai, China

Victorian Government Business Office  
Shanghai Centre, Suite 620  
1376 Nanjing Road (West)  
Shanghai 200040  
China  
Phone: +86 21 6279 8681  
Fax: +86 21 6279 8575  
shanghai@invest.vic.gov.au

## Tokyo, Japan

Victorian Government Business Office  
13th Floor, Fukoku Seimei Building  
2-2-2 Uchisaiwai-cho  
Chiyoda-ku  
Tokyo 100-0011  
Japan  
Phone: +81 3 3519 3371  
Fax: +81 3 3519 3375  
tokyo@invest.vic.gov.au

## Chicago, United States

Victorian Government Business Office  
161 N Clark St Ste 4700  
Chicago IL 60601-3201  
U.S.A.  
Phone: +1 312 523 2116  
Fax: +1 312 523 2001  
chicago@invest.vic.gov.au

## New York, United States

Victorian Government Business Office  
330 Madison Ave Fl 6  
New York NY 10017-5041  
U.S.A.  
Phone: +1 212 573 0955  
Fax: +1 212 573 0957  
newyork@invest.vic.gov.au

## San Francisco, United States

Victorian Government Business Office  
575 Market St Ste 375  
San Francisco CA 94105-5841  
U.S.A.  
Phone: +1 415 856 0552  
Fax: +1 415 856 0517  
sanfrancisco@invest.vic.gov.au

## Washington DC Area, United States

Victorian Government Business Office  
2011 Crystal Dr Fl 4 (#458)  
Arlington VA 22202-3709  
U.S.A.  
Phone: +1 703 682 6830  
washingtondc@invest.vic.gov.au

## Frankfurt, Germany

Victorian Government Business Office  
Eschenheimer Anlage 26  
Frankfurt am Main 60318  
Germany  
Phone: +49 69 668 0740  
Fax: +49 69 668 074 66  
frankfurt@invest.vic.gov.au

## London, United Kingdom

Victorian Government Business Office  
Victoria House, Melbourne Place  
Strand, London WC2B 4LG  
United Kingdom  
Phone: +44 207 836 2656  
Fax: +44 207 240 6025  
london@invest.vic.gov.au













DOT/099/12